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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MAYES, MELVIN C	
ART UNIT	**PAPER NUMBER**
1734	

DATE MAILED: 12/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/038,957	VAIDYANATHAN ET AL.	
	Examiner	Art Unit	
	Melvin Curtis Mayes	1734	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-11 is/are pending in the application.

4a) Of the above claim(s) 9-11 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-5,7 and 8 is/are rejected.

7)☒ Claim(s) 6 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7/12/02.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

(1)

Applicant's election without traverse of Claims 1-8 on 8/27/03 is acknowledged.

Claim Rejections - 35 USC § 103

(2)

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

(3)

Claims 1, 5, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Allaire et al. 5,024,978 in view of Jang et al. 5,936,861.

Allaire et al. disclose a method of making a ceramic matrix composite comprising: combining a fiber reinforcement material such as a single fiber or fiber bundle with powdered ceramic matrix material suspended in a thermoplastic vehicle containing thermoplastic polymer to form a coated continuous fiber tow or single fiber; forming cut fiber lengths into a fiber-parallel array or lay-up, applying moderate heating and pressure to reform the array into a relatively dense composite prepreg; heating the prepreg to a binder removal temperature and consolidating to a dense ceramic matrix composite by hot pressing. Allaire et al. disclose providing a suspension of 70 volume % ceramic powder and 30 volume % thermoplastic vehicle (col. 8, lines 20-42). Allaire et al. do not disclose making a lay-up of fiber by using a movable assembly to deposit coated fiber on a working surface.

Jang et al. teach that three-dimensional composite material objects can be made in a cost effective fabrication process from continuous fiber reinforced composite material in a layer-by-layer manner by using a dispensing head moved relative to a base member to dispense a mixture of reinforcement fiber impregnated with a matrix material onto the base member at a controlled rate in multiple layers in a predetermined pattern dictated by the shape of the object to be formed. The movement of the dispensing head is achieved through drive signals inputted from a computer supported by a CAD/CAM system which contains software to design and create the

object to be formed. Jang et al. teach that the fabrication process can be used with filaments impregnated with matrix material in powder form held in a polymeric binder which serves to glue the powder particles to the fiber surface (col. 1-10).

It would have been obvious to one of ordinary skill in the art to have modified the method of Allaire et al. for making a ceramic matrix composite by making the fiber lay-up using a movable dispensing head to dispense the coated continuous fiber or fiber tow, as taught by Jang et al., as a cost-effective fabrication process for forming a composite material object by laying up a filament layer by layer. Using a dispensing head that is movable relative to a base member on which the matrix material coated continuous fiber is to be dispensed to dispense the fiber in layers in a predetermined pattern of the object to be formed by lay-up of the fiber would have been obvious to one of ordinary skill in the art as taught by Jang et al. for making a composite material object from a filament impregnated (coated) with matrix material powder held in a polymeric binder.

Creating a drawing of the object to be formed and generating input signals for directing the dispensing head, as claimed in Claim 7, would have been obvious to one of ordinary skill in the art, as Jang et al. teach that the movement of the dispensing head is achieved through drive signals inputted from a computer supported by a CAD/CAM system which contains software to design and create the object to be formed.

(4)

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 1 above, and further in view of Gardner et al. 5,154,787.

Gardner et al. teach that in making a ceramic composite article from prepreg tow of a continuous fiber infiltrated (coated) with a thermoplastic binder suspension of powdered ceramic matrix material, the prepreg tow is first preheated above the softening point of the thermoplastic binder prior to contact with the collection substrate and tow previously collected on the substrate to insure that the thermoplastic binder is sufficiently softened to fuse to adjoining or underlying strand material during collection (col. 3, lines 5-19).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a composite object by preheating the coated continuous fiber or fiber tow before laying the fiber, as taught by Gardner et al., to heat the coated fiber above the softening point of the thermoplastic polymer binder prior to contact with the collection substrate and tow previously collected on the substrate to insure that the thermoplastic binder is sufficiently softened to fuse to adjoining or underlying strand material during collection.

(5)

Claims 3 and 4 rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 1 above, and further in view of Clarke et al. 5,562,966.

Allaire et al. disclose that the fiber can be carbon fiber.

Clarke et al. teach that in using carbon fibers to make a composite such as a ceramic matrix composite to be subjected to high temperatures in an oxidizing environment, the fibers are

provided with a uniform, oxidation inhibitor layer of inhibitor such as silicon carbide, boron carbide, boron nitride to protect the carbon fibers from deterioration and erosion due to oxidation (col. 1, lines 9-16, col. 3, line 61 – col. 5, line 15).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by providing the carbon fiber with an interface layer of silicon carbide, boron carbide or boron nitride, as taught by Clarke et al., to provide carbon fiber used in ceramic matrix composite with an oxidation inhibitor layer to protect the carbon fiber from deterioration and erosion due to oxidation.

(6)

Claims 1, 3-5, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hilmas et al.6,355,338 in view of Jang et al.

The applied reference, Hilmas et al., has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after

November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Hilmas et al. disclose a method of making a desired architecture from a continuous filament comprising: forming a continuous filament of carbon fiber tow having an interface layer of material such as graphite and material-laden composition of thermoplastic polymer and at least about 40 volume % ceramic or metallic particulate; arranging the continuous filament into a desired architecture by laying up into a part; laminating by heating and squeezing; heating to burn out the thermoplastic to provide a fiber reinforced composite; and consolidating to form a fully dense fiber reinforced composite (col. 5-9). Hilmas et al. do not disclose laying up the continuous fiber by using a movable assembly to deposit coated fiber on a working surface.

Jang et al. teach that three-dimensional composite material objects can be made in a cost effective fabrication process from continuous fiber reinforced composite material in a layer-by-layer manner by using a dispensing head moved relative to a base member to dispense a mixture of reinforcement fiber impregnated with a matrix material onto the base member at a controlled rate in multiple layers in a predetermined pattern dictated by the shape of the object to be formed. The movement of the dispensing head is achieved through drive signals inputted from a computer supported by a CAD/CAM system which contains software to design and create the object to be formed. Jang et al. teach that the fabrication process can be used with filaments impregnated with matrix material in powder form held in a polymeric binder which serves to glue the powder particles to the fiber surface (col. 1-10).

It would have been obvious to one of ordinary skill in the art to have modified the method of Hilmas et al. for making a desired architecture composite from a continuous carbon tow filament by laying up the continuous filament using a movable dispensing head to dispense the coated continuous fiber or fiber tow, as taught by Jang et al., as a cost-effective fabrication process for forming a composite material object by laying up a filament layer by layer. Using a dispensing head that is movable relative to a base member on which the matrix material coated continuous fiber is to be dispensed to dispense the fiber in layers in a predetermined pattern of the object to be formed by lay-up of the fiber would have been obvious to one of ordinary skill in the art as taught by Jang et al. for making a composite material object from a filament impregnated (coated) with matrix material powder held in a polymeric binder.

Creating a drawing of the object to be formed and generating input signals for directing the dispensing head, as claimed in Claim 7, would have been obvious to one of ordinary skill in the art, as Jang et al. teach that the movement of the dispensing head is achieved through drive signals inputted from a computer supported by a CAD/CAM system which contains software to design and create the object to be formed.

(7)

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 1 above, and further in view of Gardner et al. 5,154,787.

Gardner et al. teach that in making a ceramic composite article from prepreg tow of a continuous fiber infiltrated (coated) with a thermoplastic binder suspension of powdered ceramic matrix material, the prepreg tow is first preheated above the softening point of the thermoplastic binder prior to contact with the collection substrate and tow previously collected on the substrate

to insure that the thermoplastic binder is sufficiently softened to fuse to adjoining or underlying strand material during collection (col. 3, lines 5-19).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a composite object by preheating the coated continuous fiber tow before laying the fiber, as taught by Gardner et al., to heat the coated fiber above the softening point of the thermoplastic polymer binder prior to contact with the collection substrate and tow previously collected on the substrate to insure that the thermoplastic binder is sufficiently softened to fuse to adjoining or underlying strand material during collection.

Double Patenting

(8)

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

(9)

Claims 1, 3, 5, 7 and 8 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 9 and 10 of U.S. Patent No. 6,355,338 in view of Jang et al. and Allaire et al.

U.S. Patent No. 6,355,338 claims a method for making a green fiber reinforced composite comprising: forming a continuous filament consisting of a carbon fiber, an interface and a material laden polymer composition of thermoplastic polymer and at least about 40 volume % of a ceramic or metallic particulate material; and arranging the continuous filament into a desired architecture to provide a green fiber reinforced composite. U.S. Patent No. 6,355,338 does not claim arranging the filament into a desired architecture by the steps of passing to a movable assembly, depositing, heating, compressing and solidifying.

Jang et al. teach that three-dimensional composite material objects can be made in a cost effective fabrication process from continuous fiber reinforced composite material in a layer-by-layer manner by using a dispensing head moved relative to a base member to dispense a mixture of reinforcement fiber impregnated with a matrix material onto the base member at a controlled rate in multiple layers in a predetermined pattern dictated by the shape of the object to be formed. The movement of the dispensing head is achieved through drive signals inputted from a computer supported by a CAD/CAM system which contains software to design and create the object to be formed. Jang et al. teach that the fabrication process can be used with filaments impregnated with matrix material in powder form held in a polymeric binder which serves to glue the powder particles to the fiber surface (col. 1-10).

Allaire et al. teach that in making a ceramic matrix composite by combining a fiber reinforcement material such as a single fiber or fiber bundle with powdered ceramic matrix material suspended in a thermoplastic vehicle containing thermoplastic polymer to form a coated continuous fiber tow or single fiber; and forming fiber lengths into a fiber-parallel array or lay-up, moderate heat and pressure is applied to reform the array into a relatively dense composite prepreg before heating the prepreg to a binder removal temperature and consolidating to a dense ceramic matrix composite by hot pressing (col. 8, lines 20-42).

It would have been obvious to one of ordinary skill in the art to have modified the method of U.S. Patent No. 6,355,338 for making a desired architecture composite from a continuous carbon tow filament by laying up the continuous filament using a movable dispensing head to dispense the coated continuous fiber or fiber tow, as taught by Jang et al., as a cost-effective fabrication process for forming a composite material object by laying up a filament layer by layer. Using a dispensing head that is movable relative to a base member on which the matrix material coated continuous fiber is to be dispensed to dispense the fiber in layers in a predetermined pattern of the object to be formed by lay-up of the fiber would have been obvious to one of ordinary skill in the art as taught by Jang et al. for making a composite material object from a filament impregnated (coated) with matrix material powder held in a polymeric binder.

Heating and compressing the deposited carbon tow would have been obvious to one of ordinary skill in the, as Allaire et al. teach that moderate heat and pressure is applied to the lay-up of matrix coated fiber to reform the array into a relatively dense composite.

Creating a drawing of the object to be formed and generating input signals for directing the dispensing head, as claimed in Claim 7, would have been obvious to one of ordinary skill in

the art, as Jang et al. teach that the movement of the dispensing head is achieved through drive signals inputted from a computer supported by a CAD/CAM system which contains software to design and create the object to be formed.

(10)

Claim 2 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the references as applied to claim 1 above, and further in view of Gardner et al. 5,154,787.

Gardner et al. teach that in making a ceramic composite article from prepreg tow of a continuous fiber infiltrated (coated) with a thermoplastic binder suspension of powdered ceramic matrix material, the prepreg tow is first preheated above the softening point of the thermoplastic binder prior to contact with the collection substrate and tow previously collected on the substrate to insure that the thermoplastic binder is sufficiently softened to fuse to adjoining or underlying strand material during collection (col. 3, lines 5-19).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined for making a composite object by preheating the coated continuous fiber or fiber tow before laying the fiber, as taught by Gardner et al., to heat the coated fiber above the softening point of the thermoplastic polymer binder prior to contact with the collection substrate and tow previously collected on the substrate to insure that the thermoplastic binder is sufficiently softened to fuse to adjoining or underlying strand material during collection.

(11)

Claim 4 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over the references as applied to claim 3 above, and further in view of Clarke et al. 5,562,966.

Clarke et al. teach that in using carbon fibers to make a composite such as a ceramic matrix composite to be subjected to high temperatures in an oxidizing environment, the fibers are provided with a uniform, oxidation inhibitor layer of inhibitor such as silicon carbide, boron carbide, boron nitride to protect the carbon fibers from deterioration and erosion due to oxidation (col. 1, lines 9-16, col. 3, line 61 – col. 5, line 15).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by providing the carbon fiber with an interface layer of silicon carbide, boron carbide or boron nitride, as taught by Clarke et al., to provide carbon fiber used in ceramic matrix composite with an oxidation inhibitor layer to protect the carbon fiber from deterioration and erosion due to oxidation.

Allowable Subject Matter

(12)

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

(13)

Claim 1 would be allowable if step (a) was amended to read:

"(a) forming a feed rod having a longitudinal axis and comprising a material-laden polymer composition comprising a thermoplastic polymer and at least about 40 volume % of a ceramic or metallic particulate material;

forming a hole down the longitudinal axis of the feed rod;

inserting the start of a continuous spool of ceramic fiber, metal fiber, or carbon fiber through the hole in the feed rod;

extruding the feed rod and the spool simultaneously to form a continuous filament comprising the material-laden polymer composition completely surrounding the fiber and said filament having an average diameter that is less than the average diameter of the feed rod;" before the step (b) of passing.

Conclusion

(14)

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(15)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 703-308-1977. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

After December 18th, the Examiner can be reached at telephone number 571-272-1234.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 703-308-3853. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Melvin Curtis Mayes
Primary Examiner
Art Unit 1734

MCM
November 28, 2003